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LUNG CANCER INCIDENCE IN
QUINCY, WEYMOUTH, & BRAINTREE
1982-1986

COLLECTION
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Massachusetts Department of Public Health
Division of Environmental Epidemiology
and Toxicology
Community Assessment Unit

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INTRODUCTION:

At the request of the local boards of health as well as local and state legislative offices and concerned citizens, the Community Assessment Unit (CAU) of the Massachusetts Department of Public Health, Division of Environmental Epidemiology and Toxicology (MDPH,DEET) conducted an investigation of lung cancer incidence for 1982-1986 in the city of Quincy and the towns of Weymouth and Braintree. Interest in this investigation stems from concern over possible environmental contamination related to several historical and ongoing industrial activities in the Fore River area as well as future industrial activities proposed for the area which all three towns border.

A recent preliminary CAU investigation of lung cancer incidence in Quincy indicated a possible cluster of lung cancer cases in one census tract (CT) in Quincy (CT 4178), an area known as Germantown at the mouth of the Fore River.

This investigation evaluated this "cluster" of lung cancer cases in Germantown and also examined lung cancer incidence in Weymouth and Braintree. The results of these analyses will be considered in addressing the potential need for future environmental public health initiatives for the town.

BACKGROUND:

The city of Quincy is located 10 miles south of Boston and has a population of approximately 83,000. Quincy is bordered to the southeast by the town of Braintree (population 36,000) and to the south by the town of Weymouth (population 55,000). The three town area encompasses approximately 49 square miles surrounding the Fore River basin. All three communities are residential and predominantly white. The communities have a slightly higher per capita income than the state average and relatively low unemployment.

The Fore River area is largely residential, however, about 15% of the area is devoted to industrial uses. The Quincy shipyard, located in southeast Quincy is one of the larger industrial concerns in the area. The shipyard has been operational for over 80 years and was once the world's principle builder of liquefied natural gas carriers. The shipyard was also involved in asbestos extraction during ship repair. Today the shipyard is no longer in use, and is currently owned by the Massachusetts Water Resources Authority (MWRA).

Located near the shipyard, in Braintree, is the 11 acre site of Clean Harbors Inc. Clean Harbors operates the largest hazardous waste treatment, storage, and disposal facility in New England. Other industrial concerns in the Fore River area are Citgo Petroleum Corp, Boston Edison Co., and Proctor and Gamble Manufacturing Co.

A cancer mortality study conducted by the MDPH in 1981 investigated the relationship of community-wide exposure to asbestos and mortality from asbestos related disease. With the exception of those persons thought to be occupationally exposed, no association was found.

METHODS:

Cancer incidence data for the years 1982-1986 were obtained for each town from the Massachusetts Cancer Registry of the MDPH Bureau of Health Statistics, Research and Evaluation (BHSR&E). In order to determine whether an elevated rate of lung cancer exists in either Quincy, Weymouth or Braintree, lung cancer incidence data for each town was analyzed to compare the actual (or observed) number of lung cancer cases to the number which would have been expected based on the statewide lung cancer incidence experience.

The ratio of the observed number of cases to the expected number of cases is called the Standardized Incidence Ratio (SIR). An SIR equal to 100 indicates that the number of lung cancer cases in an area is equal to what would have been expected. An SIR of greater than 100 indicates that more cancer cases occurred than expected and, accordingly, an SIR of less than 100 means that fewer cases occurred than were expected.

Care should be taken when interpreting the SIR since one must take into account not only how large it is but also how stable it is. An SIR of 200 based on 3 expected cases and 6 observed cases is certainly large, but may be due essentially to 1 or 2 chance cases occurring from natural variation in the pattern of cancer incidence. In contrast, an SIR of 200 based on 300 expected cases and 600 observed has the same magnitude as the previous SIR but it is very stable. It is quite unlikely that 300 excess cases would occur by chance alone.

A standard statistical test (chi-square) was used to determine the stability or statistical significance of the SIR when five (5) or more cases were observed. A significant difference between the actual number of cases and the expected number of cases means that the difference is probably not due to chance. Two common cut-off points for statistical significance are probability values of less than 0.05 ($p < 0.05$) or less than 0.01 ($p < 0.01$). This means that the probability that the difference between the observed number and the expected number was due to chance is less than 5 chances in 100 (when $p < 0.05$) or less than 1 chance in one hundred (when $p < 0.01$). 95% Confidence Intervals were also calculated around the SIRs. The Confidence Interval provides an idea of the magnitude of the observed effect and of the variability of the estimate.

Place of residence at the time of diagnosis was examined for each case to assess any possible geographic clustering of cases. The available occupational information and smoking status of each case was also evaluated and will be discussed in greater detail later in this report.

RESULTS:

Quincy: Table 1 presents the SIRs for males and Table 2 presents SIRs for females by census tract (CT) and for the city as a whole. The geographic distribution of lung cancers throughout the city of Quincy are presented in figure 1. Overall, males and females experienced a moderate

Table 1

Standardized Incidence Ratios
1982-1986 Lung Cancer
Quincy, MA

Males

	Obs	Exp	SIR	95% Confidence Intervals Lower Limit	95% Confidence Intervals Upper Limit
Town	226	211.4	107	93	122
4171	14	11.3	124	68	208
4172	14	17.1	82	45	137
4173	0	0.3	0	--	--
4174	6	7.3	82	30	179
4175	26	21.3	122	69	155
4176	24	24.6	98	63	145
4177	16	19.7	81	46	132
4178	30	19.0	158 +	107	225
4179	26	23.8	109	71	160
4180	31	25.6	121	82	172
4181	23	15.6	147	93	221
4182	16	13.0	123	70	200

Note: all figures rounded
Statistical significance not calculated where the number of cases is < 5.

+ = indicates statistical significance at $p < 0.05$
++ = indicates statistical significance at $p < 0.01$

Table 2
Standardized Incidence Ratios
1982-1986 Lung Cancer
Quincy, MA

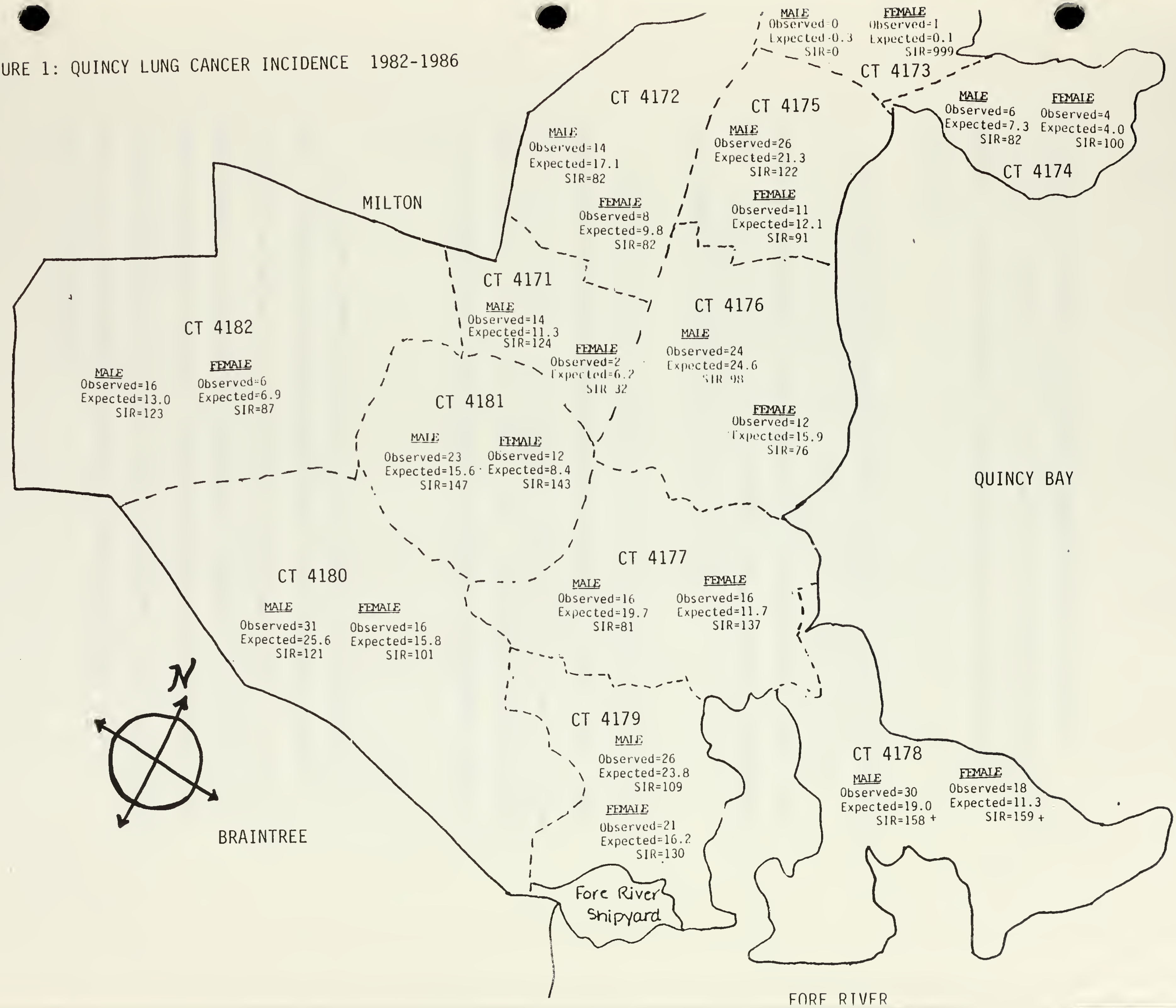
Females

	Obs	Exp	SIR	95% Confidence Intervals	
				Lower Limit	Upper Limit
Town	127	107.1	119	99	141
4171	2	6.2	32	4	117
4172	8	9.8	82	35	161
4173	1	0.1	999	13	5564
4174	4	4.0	100	27	256
4175	11	12.1	91	45	163
4176	12	15.9	76	39	132
4177	16	11.7	137	78	222
4178	18	11.3	159 +	94	252
4179	21	16.2	130	80	198
4180	16	15.8	101	58	165
4181	12	8.4	143	74	250
4182	6	6.9	87	32	189

Note: all figures rounded
Statistical significance not calculated where the number of cases is < 5.

+ = indicates statistical significance at $p < 0.05$
++ = indicates statistical significance at $p < 0.01$

FIGURE 1: QUINCY LUNG CANCER INCIDENCE 1982-1986



elevation in 1982-1986 lung cancer incidence (males: 226 cases observed/211.4 expected, SIR = 107; females: 127 cases observed/ 107.1 expected, SIR = 119) Neither of these elevations are statistically significant.

Lung cancer cases occurred either less than or at the rate expected in males in CTs 4172, 4173, 4174, 4176, and 4177. Male lung cancer incidence was elevated in CTs 4171, 4175, 4178, 4179, 4180, 4181, and 4182. The elevation observed in CT 4178 was statistically significant (30 cases observed/19 expected, SIR = 158 $p < 0.05$).

Female lung cancers occurred as often or less often than expected in the majority of census tracts in the city (CTs 4171, 4172, 4174, 4175, 4176, 4180, and 4182). Elevations were observed in the remaining census tracts (CTs 4173, 4177, 4178, 4179, 4181). The elevation observed in CT 4178 was statistically significant (18 observed/ 11.3 expected, SIR = 159).

Lung cancer cases were fairly evenly distributed throughout the city. In several areas where cases appear to be clustered there are multi-unit residences (ie: apartments, nursing homes, etc.). In CT 4178 where there is a statistically significant elevation in both male and female lung cancer incidence, the cases appeared to be clustered in the southwest quadrant of the census tract (Germantown). The concentration in cases here is due primarily to several cases residing at a senior citizen's housing complex.

Weymouth: Weymouth lung cancer incidence rates are presented for males in table 3 and for females in table 4. They are presented geographically in figure 2. Townwide, male lung cancers cases were observed about as often as expected for 1982-1986 (123 cases observed/121.2 cases expected, SIR = 101). Female lung cancer cases occurred slightly more often than expected (69 observed/64.1 expected, SIR = 108).

Male lung cancers were observed less often than expected in CTs 4221, 4224, and 4228. The incidence of male lung cancer was slightly elevated in census tract 4223. Census tracts 4222, 4225, 4226, and 4227 all experienced elevations in 1982-1986 lung cancer incidence. The elevations in census tract 4226 and 4227 were statistically significant (4226: 23 cases observed/13.4 expected, SIR = 172 $p < 0.01$; 4227: 15 cases observed/8.7 expected, SIR = 172 $p < 0.05$).

Female lung cancer incidence during this period was occurring at the expected rate or below the expected rate in CT's 4222, 4223, 4224, 4226, and 4227. Female lung cancer incidence rates were elevated in CT's 4221, 4225, and 4228. The elevation in CT 4225 was statistically significant (16 cases observed/10.3 expected SIR = 155 $p < 0.05$).

Male and female cases appear to be dispersed throughout the town. Four census tracts border the Fore River area (4224, 4226, 4227, and 4228). Two of these census tracts have significantly elevated lung cancer rates in men, however there does not appear to be any clustering of events within the individual tracts.

Table 3
Standardized Incidence Ratios
1982-1986 Lung Cancer
Weymouth, MA

Males

	Obs.	Exp	SIR	95% Confidence Intervals Lower Limit	Upper Limit
Town	123	121.2	101	84	121
4221	7	8.9	79	32	162
4222	18	14.9	121	72	191
4223	18	17.1	105	63	166
4224	16	17.2	93	53	151
4225	21	16.7	126	78	192
4226	23	13.4	172 ++	109	258
4227	15	8.7	172 +	96	284
4228	5	9.8	51	16	119

Note: all figures rounded
Statistical significance not calculated where the number of cases is < 5.

+= indicates statistical significance at $p < 0.05$
++= indicates statistical significance at $p < 0.01$

Table 4

Standardized Incidence Ratios
1982-1986 Lung Cancer
Weymouth, MA

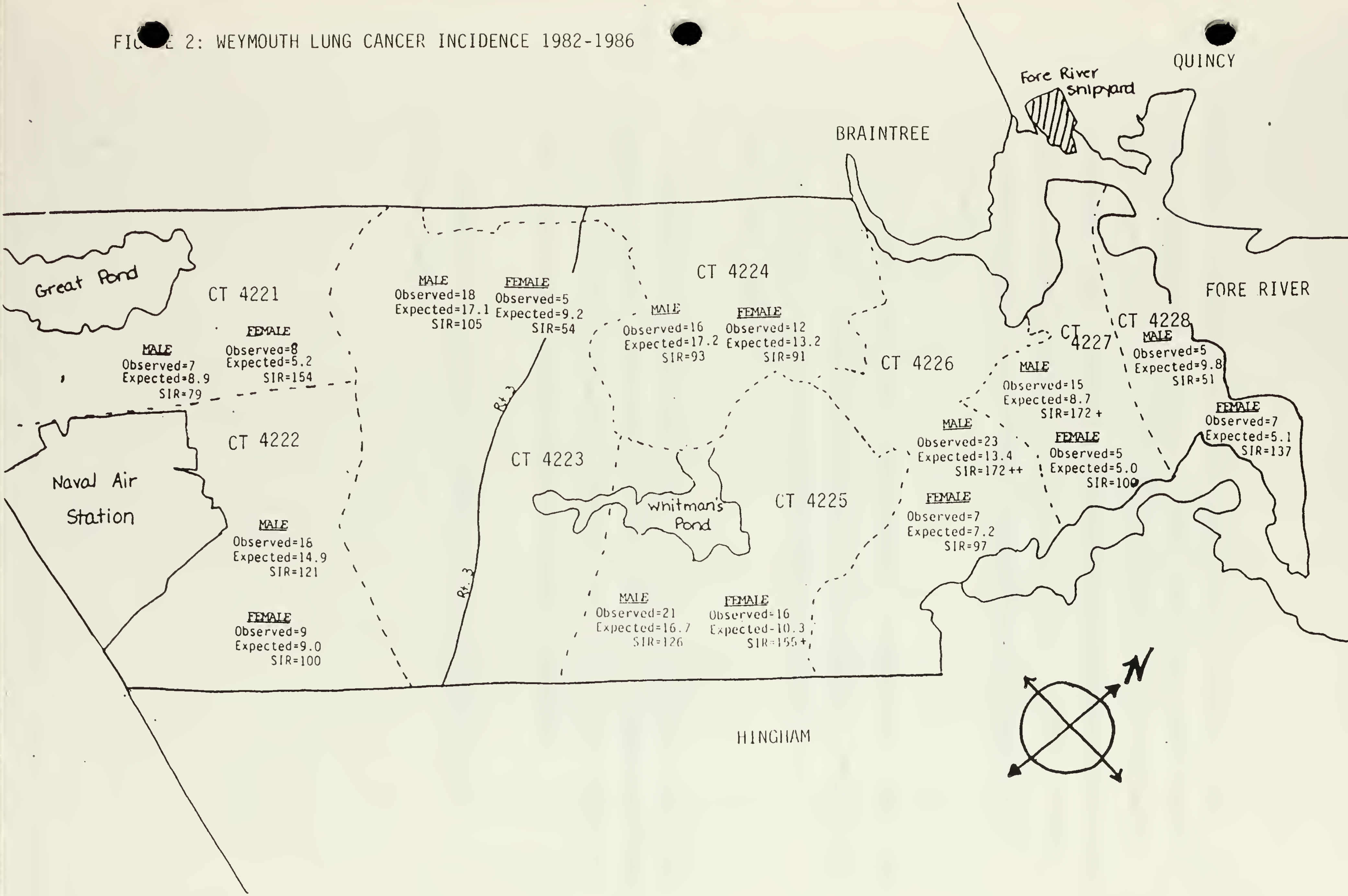
Females

	Obs.	Exp	SIR	95% Confidence Intervals Lower Limit	Upper Limit
Town	69	64.1	108	84	136
4221	8	5.2	154	66	303
4222	9	9.0	100	46	190
4223	5	9.2	54	18	127
4224	12	13.2	91	47	159
4225	16	10.3	155 +	89	252
4226	7	7.2	97	39	200
4227	5	5.0	100	32	233
4228	7	5.1	137	55	283

Note: all figures rounded
Statistical significance not calculated where the number of cases is < 5.

+= indicates statistical significance at $p < 0.05$
++= indicates statistical significance at $p < 0.01$

FI[illegible]E 2: WEYMOUTH LUNG CANCER INCIDENCE 1982-1986



Braintree: Braintree lung cancer incidence is presented in tables 5 and 6 and geographically in figure 3. Overall, male lung cancers occurred slightly more often than expected for 1982-1986 (83 cases observed/78 expected SIR = 106). Female lung cancers occurred essentially at the rate expected (47 cases observed/46 expected SIR = 102). The rates for males and females combined and considered separately are not statistically significant

Fewer cases were observed than expected for males in CT's 4192, 4195, 4197, and 4198. Alternatively, elevations were observed in census tracts 4191, 4193, 4194, and 4196. Only the elevation in CT 4191 is statistically significant.

Female lung cancers occurred about as often as expected or less than expected in census tracts 4192, 4194, 4195, and 4198. Moderately elevated lung cancer incidence rates were observed in CTs 4191, 4193, 4196, and 4197. None of the elevations were statistically significant.

Clustering of cases was not evident in Braintree males or in Braintree females.

Table 5

Standardized Incidence Ratios
1982-1986 Lung Cancer
Braintree, MA

Males

	Obs	Exp	SIR	95% Confidence Intervals Lower Limit	Upper Limit
Town	83	78.0	106	85	132
4191	20	13.1	153 +	93	236
4192	9	12.2	74	34	140
4193	11	8.7	126	63	226
4194	9	7.3	123	56	234
4195	6	7.3	82	30	179
4196	12	10.0	120	62	210
4197	4	7.3	55	15	140
4198	12	12.1	99	51	173

Note: all figures rounded
Statistical significance not calculated where number of cases is < 0.05
+ = indicates statistical significance at $p < 0.05$
++ = indicates statistical significance at $p < 0.01$

Table 6

Standardized Incidence Ratios
1982-1986 Lung Cancer
Braintree, MA

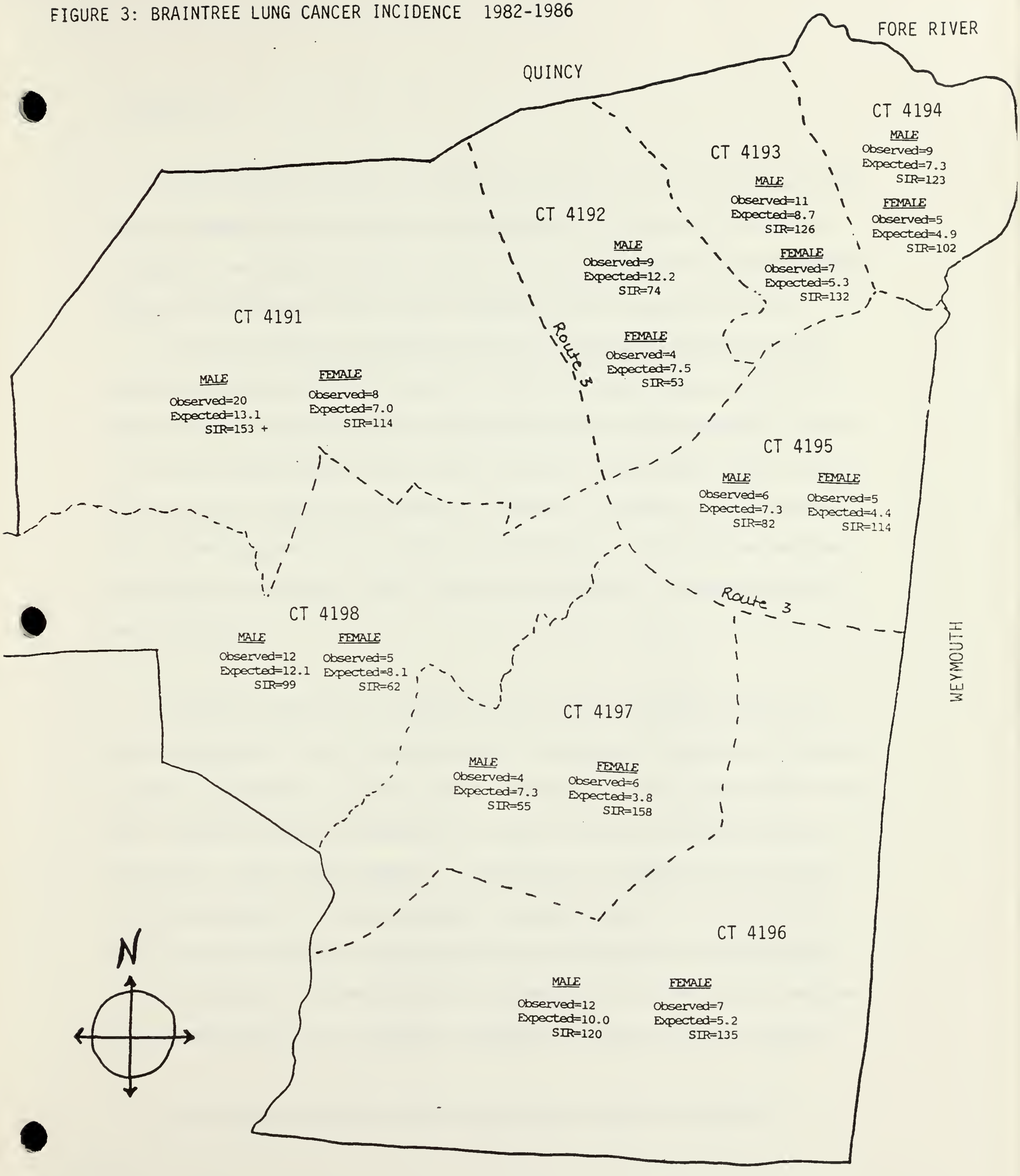
Females

	Obs	Exp	SIR	95% Confidence Intervals Lower Limit	95% Confidence Intervals Upper Limit
Town	47	46.0	102	75	136
4191	8	7.0	114	49	225
4192	4	7.5	53	14	137
4193	7	5.3	132	34	228
4194	5	4.9	102	33	238
4195	5	4.4	114	37	265
4196	7	5.2	135	54	277
4197	6	3.8	158	58	344
4198	5	8.1	62	20	144

Note: all figures rounded
Statistical significance not calculated where number of cases is < 5.

+ = indicates statistical significance at $p < 0.05$
++ = indicates statistical significance at $p < 0.01$

FIGURE 3: BRAINTREE LUNG CANCER INCIDENCE 1982-1986



Occupation:

The occupational status of each lung cancer case (as reported to the cancer registry by the hospital of diagnosis) was assessed in order to attempt to ascertain the contribution that occupational exposures may have played in relation to lung cancer morbidity in the three town area.

For each town the predominant reported occupation among males and females was "retired" or "unknown". 33.3% of Quincy males and 63.3% of Quincy females were reported as unknown or retired for occupation. 42.3% of the male lung cancer cases and 62.7% of the female lung cancer cases in Weymouth were reported as unknown or retired or disabled. In Braintree the percentages were 43.4% and 51.1% respectively. The high percentages of unknown occupations present several limitations to the interpretation of the data.

Several individuals in each area had listed occupations which are often associated with an increased risk of exposure to asbestos (shipyard workers, pipefitters, roofers, etc.). In Quincy, 11.9% of the males cases were listed as having occupations in which they may have been exposed to asbestos. Among Quincy females, 1.6% listed an occupation with possible asbestos exposure. Of the Weymouth lung cancer cases, 7.3 % of the male cases reported suspect occupations--none of the females reported higher risk occupations. In Braintree 9.6% of males and and none of the females reported working in an occupation suspected of having asbestos exposure.

The actual percentage of the lung cancer cases with possible

occupational exposure to asbestos may be quite a bit higher than what is reported above. This is because it is quite plausible that a proportion of the individuals reported as "unknown/retired" worked in industries that exposed them to asbestos. Of the individuals with a reported occupation (ie: not retired or unknown) 20% of Quincy males and 3.9% of the Quincy females reported occupations with possible asbestos exposure. Of Weymouth males 8.6% reported occupations with possible exposure (there were no females). Of the reported occupations in Braintree, 17.0% of the males were in occupations known to have possible asbestos exposure again no females were reported in these occupations.

Of the other occupations reported for the lung cancer cases, none of the occupational titles listed were those that have been associated with an increased risk of developing lung cancer according to the most recent scientific literature.

Smoking:

Smoking status for lung cancer cases was evaluated on a percentage basis for each town and for CT 4178 in Quincy. Results are presented in table 7. Since cigarette smoking is the leading cause of lung cancer it was not surprising to find that the majority of lung cancer cases in each town and in CT 4178 were either current or former smokers at the time of their diagnosis. Additionally these percentages do not appear to be appreciably different than those found statewide among lung cancer cases. Furthermore, the differences between males and females found within each area and in the state are consistent with historical female smoking patterns.

It would be imprudent to assess differences between the reported percentages in specific geographic areas and/or between the areas and the state since discrepancies in the percent breakdown of the reported smoking status between areas can be accounted for by the large number individuals with an unknown smoking status, an unfortunate limitation of the data.

Further attempts were made to characterize smoking prevalence among the residents of the three town area. To this end, risk ratios were calculated in order to determine whether the populations of Quincy, Weymouth and Braintree were smoking significantly more (or less) than the rest of the state. The risk ratio is an estimate of the magnitude of association -- usually between a given disease and a given exposure, however, for these analyses the risk ratio provides an estimate of the likelihood of being a resident of either Quincy, Weymouth, Braintree and

being a cigarette smoker as compared to living in the rest of the state and being a cigarette smoker.

As data smoking status is not available for the entire population of any of the three towns nor for the state, smoking habits were assessed using the smoking status of all 1982-1986 cancer cases as collected by the cancer registry. The data were divided as current/former smoker vs. never smoked (persons with an unknown smoking status were not included in these calculations). The risk ratio was calculated for males and females aged 20 years and older among residents of each town separately, compared to the rest of the state. We also compared CT 4178 to the rest of Quincy and to the rest of the state. To further clarify, the risk ratio will quantify, among cancer cases, the likelihood (or "risk") of living in any of the previously mentioned areas given an individuals smoking status.

Or, essentially, are people (defined as cancer cases) living in Quincy, Weymouth, or Braintree more likely or less likely to smoke than people in the rest of the State; and are people (cancer cases) residing in CT 4178 more likely or less likely to smoke than people in the rest of Quincy or the rest of the state.

A risk ratio of 1 indicates that the likelihood of living in a given area (one of the three towns or CT 4178) and being a current or

TABLE 7

PERCENT BREAKDOWN OF SMOKING STATUS OF LUNG CANCER CASES BY AREA AND SEX

	current/former		never		unknown	
	%	n	%	n	%	n
QUINCY (excludes 4178)						
Males	82.1%	(161)	4.6%	(9)	13.3%	(26)
Females	78.9%	(86)	10.1%	(11)	11.0%	(12)
CT 4178						
Males	90.0%	(27)	3.3%	(1)	6.7%	(2)
Females	88.9%	(16)	5.6%	(1)	5.6%	(1)
WEYMOUTH						
Males	78.0%	(96)	4.9%	(6)	17.1%	(21)
Females	73.9%	(51)	8.7%	(6)	17.4%	(12)
BRAINTREE						
Males	69.9%	(58)	6.0%	(5)	24.1%	(20)
Females	63.8%	(30)	12.8%	(6)	23.4%	(11)
STATE						
Males	81.2%	(9416)	4.7%	(547)	14.1%	(1637)
Females	74.2%	(4783)	11.3%	(727)	14.5%	(937)

former smoker is no different than living in the same given area and never having smoked. That is: one is not any more likely to live in the specified area if one is a smoker. A risk ratio of 2 would indicate that individuals in a given area are two times as likely to live in the area if they smoke. Conversely, a risk ratio of 0.5 indicates that the population in a given area is only half as likely to live in the area if they smoke.

The results of these analyses are presented in table 8. Briefly, among female cancer cases in all three towns aged 20 years and older current or former smokers were not more likely to have lived in any one of the three towns (ie: the risk ratio = 1). Males in Quincy and Braintree also had risk ratios of approximately 1. The risk ratio for Weymouth males was slightly higher than 1, that is: these data suggest that among males, smokers may be more likely to have lived in Weymouth than non smokers. This finding was statistically significant ($p < 0.05$). However, since the risk ratio is relatively close to 1, it is suggestive of only a weak association.

Male cancer cases in CT 4178 are not any more likely to have lived there and be reported as current or former smokers than males who didn't smoke; in fact these data suggest that males reported as current or former smokers are slightly less likely to have lived in this census tract than males who didn't smoke. Females, however, do appear to be somewhat more likely to have lived in this CT and be reported as current or former smokers than females who didn't smoke whether the comparison population is females in the rest of Quincy or females throughout the state, (ie: it

TABLE 8

RISK RATIOS for SMOKING

	Risk Ratio	95% Confidence Intervals Lower	Upper
Quincy			
males	1.03	0.89	1.20
females	1.12	0.98	1.28
Weymouth			
males	1.35*	1.06	1.70
females	1.07	0.88	1.30
Braintree			
males	1.05	0.81	1.36
females	1.01	0.81	1.27
CT 4178 (using rest of Quincy as comparison)			
males	0.85	0.52	1.38
females	2.10*	1.34	3.28
CT 4178 (using state as comparison)			
males	0.90	0.57	1.42
females	2.18*	1.43	3.29

* = $p < 0.05$

appears from these data that females in this section of Quincy may smoke more than females elsewhere in Quincy or the state). This finding was statistically significant ($p < 0.05$).

There are several limitations inherent in these data and therefore the results should be interpreted with these in mind. Primarily, there are a large number of individuals for whom the smoking status was reported as unknown. If the ratio of individuals who lived in a specified area and are reported as "current/former smokers" compared to those who are reported as "never smoked" among these individuals is different from that which is already known the present results would be biased to some degree. In addition, as stated before, these smoking data are collected from cancer patients only and therefore may not reflect the true smoking behaviors of the rest of a given area. Also, degree of exposure (ie: how much and how long an individual smoked), an important indicator of lung cancer risk is not known.

DISCUSSION:

Lung cancer represents approximately 15% of all cancers nationwide (22% in males and 8% in females). Cigarette smoking is by far the major risk factor for the development of lung cancer. The federal Office of Smoking and Health estimates that in the United States, cigarette smoking accounts for 95% of lung cancer deaths in males and approximately 80% of the lung cancer deaths seen in females. The risk of developing lung cancer (or other tobacco related cancers) depends upon the intensity of the smoking habit (i.e.: duration of habit, "tar" yield of cigarette, and amount smoked). Fortunately, the risk of lung cancer declines after smoking cessation. However, investigators estimate that it can take more than 10 years of not smoking for a long-term, heavy smoker to reduce their risk to a level similar to that of a non-smoker. There is increasing evidence that passive smoking (exposure to second hand smoke) may increase an individuals risk of contracting lung cancer. The degree of this risk has not yet been fully established.

Lung cancer trends reveal that lung cancer has become a disease increasingly associated with populations of lower socio-economic status, since it is likely (according to current research) that these individuals smoke more. Additionally, air pollutants commonly found in urban air have been associated with increased lung cancer incidence in urban areas, however, this finding has not yet been substantiated. Several occupational exposures have been associated with an increased risk of developing lung cancer. Some of these are: exposure to chromium (plating,etc.) nickel (smelting, roasting and electrolysis), ionizing

radiation (x-ray, gamma ray), radon and radon daughters (uranium mining), inorganic arsenic (sheep-dip manufacture, copper smelting, pesticide/herbicide manufacturing), chloromethyl ethers (manufacture of ion-exchange resins), and asbestos (shipbuilding, textiles, millers, roofers).

CONCLUSIONS/RECOMMENDATIONS

In a descriptive study such as this one, cause and effect cannot truly be determined. Only existing data that are routinely collected by the MDPH Bureau of Health Statistics Research and Evaluation (ie: cancer incidence data, etc.) were utilized. By themselves these types of data are insufficient evidence to determine cause and effect with regard to disease morbidity or mortality and should be examined cautiously in attempting to assess the potential influence of environmental exposures. In addition, definitive information on crucial factors influencing disease morbidity and mortality such as occupational history, medical history, residential history, life-style risk factors, socio-economic status and access to medical care are not accounted for and therefore could not be considered in these analyses.

Despite the inherent limitations in the use of descriptive data, by identifying areas where a greater (or fewer) number of cancer cases have occurred, these types of studies are useful in determining whether further study may be warranted in a particular area and to provide guidance in targeting public health intervention programs.

The lack of occupational data did not allow the determination of what role, if any, occupation may have played in the development of lung cancers in Quincy, Weymouth and Braintree. Because of the industrial history of the area and because of the known asbestos exposure risk in some of the reported occupations, it is reasonable to assume that

occupation may have been at least partly responsible for some of the observed lung cancer cases. It is not possible, however, to quantify the cases. It should also be reiterated here that while historical occupational information can be an important indicator of future cancer risk, unfortunately occupational histories are not routinely collected data.

The available occupational data from the cancer registry are by no means definitive with regard to occupational exposures, as an individual may have worked in an occupation that exposed him to lung carcinogens earlier in his life and then spent most of his life working at a job where they encountered no other adverse exposures. In all likelihood, the latter occupation would have been the one reported to the cancer registry. Likewise, a person could report her job as "worked at shipyard" which could lead investigators to suspect exposure to asbestos, a potent lung carcinogen. However, this individual may have held a job within the shipyard that did not expose her to asbestos (ie: clerical, management, etc.).

Analysis of smoking status revealed that overall townwide/citywide smoking trends were not radically different than those found in the rest of the state. Though there was a significant increase in smoking prevalence among Weymouth males the observed increase was weak. In CT 4178, available data suggest that females may be smoking moderately more than females elsewhere

and this could be an alternate explanation for the significant increase in female lung cancer observed there. However, given the limitations of the available smoking data, these findings should be interpreted with caution.

The cluster of cases observed in the Germantown area of census tract 4178 was discovered to be due principally to a number of individuals residing in a senior citizen apartment building. As there are age restrictions for residence in these types of complexes it is doubtful that these individuals resided at this address during the latency period of their cancers. As the reported rates are standardized for the age distribution of the population this finding does not explain the significant elevation in lung cancer observed in this census tract but may explain the cluster of cases observed.

Overall, for each town considered as a whole, lung cancer occurred at approximately the rate expected for the years 1982-1986. Perhaps the most interesting finding in these analyses was the significant elevation in lung cancer incidence found in both males and females in CT 4178. The significant elevations observed in parts of Weymouth and Braintree were due primarily to an elevation in only males or females rather than in both sexes. Findings such as this may suggest something other than an environmental association, as it would be expected that any community-wide exposure to lung carcinogens would be accompanied by an increase in lung cancers among both sexes.

It is beyond the scope of this investigation to provide an assessment of current respiratory health in the communities of Quincy, Weymouth and Braintree. Because of the long latency period for lung cancer, the current lung cancer cases are probably indicative of exposure to lung carcinogens that occurred 20-40 years ago.

Several of the census tracts where elevations were observed border the Fore River area. This report cannot demonstrate the synergistic roles that smoking, occupation and/or environmental exposures may have had in the development of disease in the area where elevations were observed but, none the less, has established that these residents have developed lung cancer more often than those elsewhere in any of the three towns considered separately or combined.

Based upon these findings the Department recommends that:

1) Smoking cessation campaigns be considered and targeted in some of these areas and

2) The results of the analyses in this report should be considered in the assessment of current or potential future environmental impacts in certain geographic regions of the three town area.

BIBLIOGRAPHY

Airborne Pollutants and Respiratory Cancer in Environmental Health Perspectives, Vol. 70, December 1986

Baseline Report: Rotary Kiln Incinerator Project. Clean Harbors Inc., 1989.

Hennekens, Charles H. & Buring, Julie E. Epidemiology in Medicine. Little Brown Co., Boston, 1987

International Classification of Diseases for Oncology 1976 World Health Organization, Geneva, 1976

MDPH Memo to Jane Gallahue Commissioner, Quincy Department of Public Health from Suzanne K. Condon Chief Community Assessment Unit Dated 12/9/88, Re: preliminary analysis of lung cancer in Quincy.

Monson, Richard R., Occupational Epidemiology. CRC Press, Boca Raton 1986

Page, H. & Asire, A. (eds), Cancer Rates and Risks. National Institutes of Health, 1985; NIH Pub No. 85691

Parker, G.S., P.E. and Rosen, S.L., Ph.D. Quincy Mortality Analysis 1969-1978. Massachusetts Department of Public Health February 20, 1981.

Robbins, S.L. & Cotran, R.S., Pathologic Basis of Disease (2nd Ed.). W.B. Saunders & Co., Philadelphia, 1979

Rothman, Kenneth J. Modern Epidemiology. Little Brown Co. Boston, 1986

Rothman, Kenneth J. & Boice, John D. Epidemiologic Analysis With a Programmable Calculator. Epidemiology Resources Inc. Boston, 1982.

Schottenfeld, D. & Fraumeni, J.F. Jr., Cancer Epidemiology and Prevention. W.B. Saunders Co., Philadelphia 1982.